METHOD FOR FORMING DIFFUSION REGIONS IN A SILICON SUBSTRATE

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0001] The United States government has a paid-up license in this invention and the right in limited circumstances to require the patent owner to license others on reasonable terms as provided by the terms of DE-FC36-07GO17043 awarded by the DOE.

TECHNICAL FIELD

[0002] Embodiments of the subject matter described herein relate generally to solar cell manufacture. More particularly, embodiments of the subject matter relate to thin silicon solar cells and techniques for manufacture.

BACKGROUND

[0003] Solar cells are well known devices for converting solar radiation to electrical energy. They may be fabricated on a semiconductor wafer using semiconductor processing technology. A solar cell includes P-type and N-type diffusion regions. Solar radiation impinging on the solar cell creates electrons and holes that migrate to the diffusion regions, thereby creating voltage differentials between the diffusion regions. In a backside contact solar cell, both the diffusion regions and the metal contact fingers coupled to them are on the backside of the solar cell. The contact fingers allow an external electrical circuit to be coupled to and be powered by the solar cell.

[0004] Accordingly, techniques for improving the fabrication process and reducing the cost of manufacturing solar cells are generally desirable. Such techniques include printing and curing of dopants on silicon substrates through processes like ink-jet printing. These or other similar embodiments form the background of the current invention.

SUMMARY

[0004a] According to a first aspect, there is provided a method of manufacturing solar cells, the method comprising: depositing an etch-resistant dopant material on a silicon substrate, the etch-resistant dopant material comprising a dopant source;

forming a cross-linked matrix in the etch-resistant dopant material using a non-thermal cure of the etch-resistant dopant material; and heating the silicon substrate and the etch-resistant dopant material to a temperature sufficient to cause the dopant source to diffuse into the silicon substrate.

[0004b] According to a second aspect, there is provided a method of manufacturing solar cells, the method comprising: depositing a dopant material on a silicon substrate having a photovoltaic solar cell structure; forming a cross-linked matrix in the dopant material using a non-thermal exposure of the dopant material to ultraviolet light through a photo-polymerization process; and heating the silicon substrate of the dopant material to a temperature sufficient to cause the dopant source to diffuse into the silicon substrate.

[0004c] According to a third aspect, there is provided a solar cell fabricated in accordance to the second aspect.

[0004d] According to a fourth aspect, there is provided a method of manufacturing solar cells, the method comprising: forming a thin dielectric layer on a surface of a silicon substrate; forming a polysilicon layer over the thin dielectric layer; depositing an etch-resistant dopant material comprising a dopant source material on the polysilicon layer; forming a cross-linked matrix in the etch-resistant dopant material using a non-thermal cure of the etch-resistant dopant material; and heating the etch-resistant dopant material to a temperature wherein the dopant source material diffuses into the polysilicon layer.

[0004e] According to a fifth aspect, there is provided a solar cell fabricated in accordance to the fourth aspect.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] A more complete understanding of the subject matter may be derived by referring to the detailed description and claims when considered in conjunction with